Di2Mesh – Quick User Guide

- With Di2Mesh you can:
  - Measure surface-to-surface distances between two given surface meshes
  - Pre-align to correct the rigid displacements (if any)
  - Visualize the distances with a colormap
  - Visualize 3D direction of the distances
  - “Click and see” to visualize local distance values
  - Measure volume difference of two closed surfaces
  - Export distances, Images, distance vector fields.

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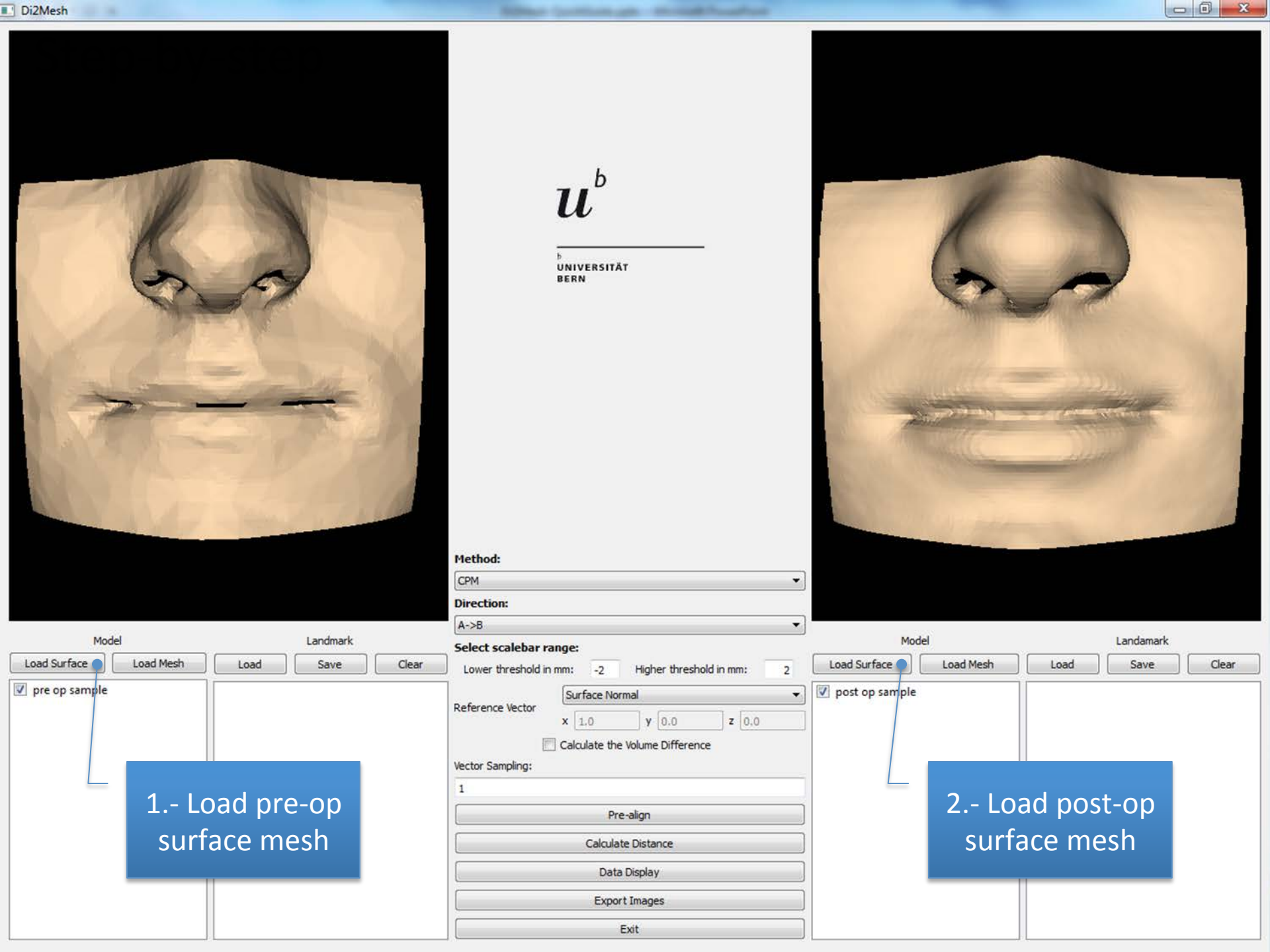
Di2Mesh
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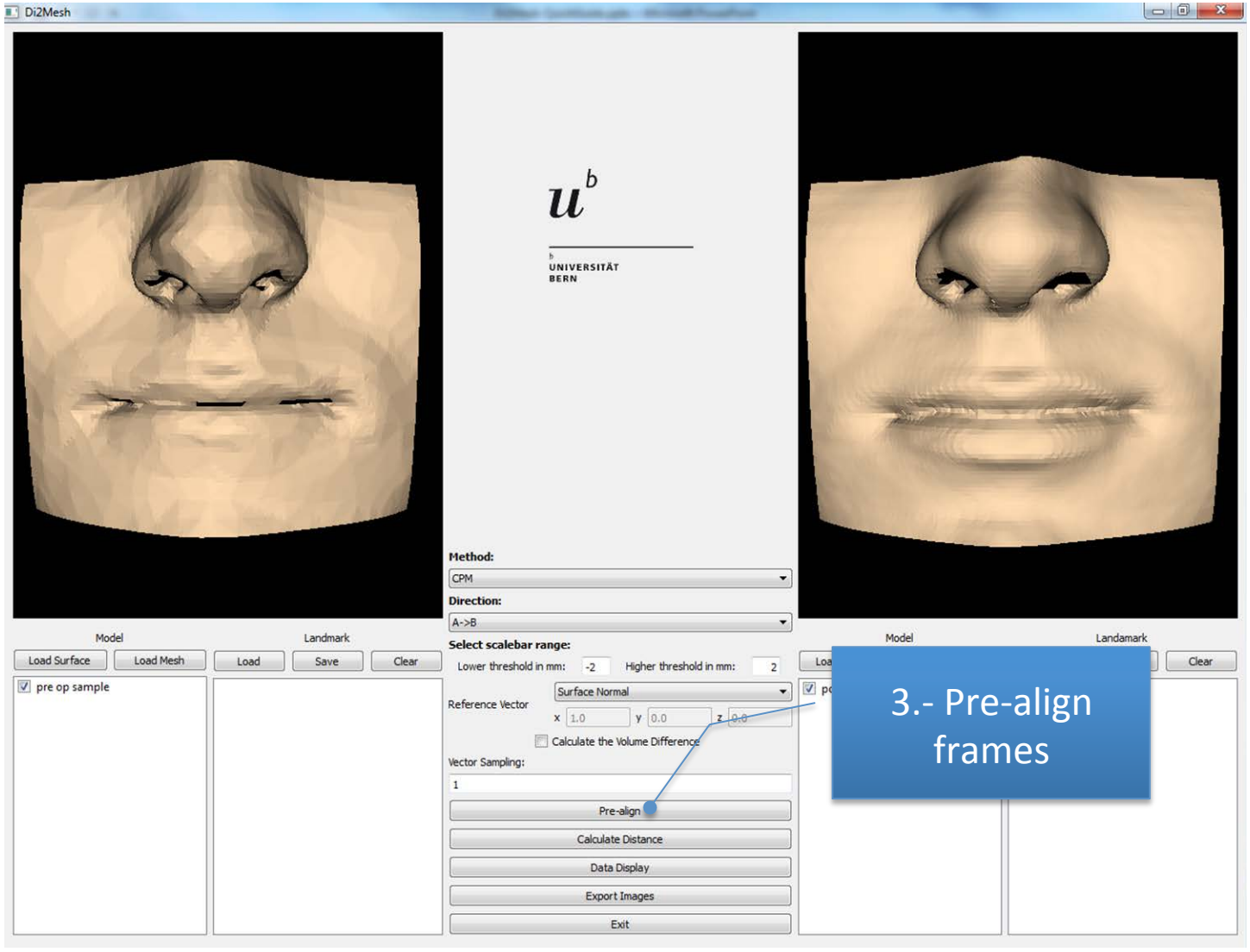
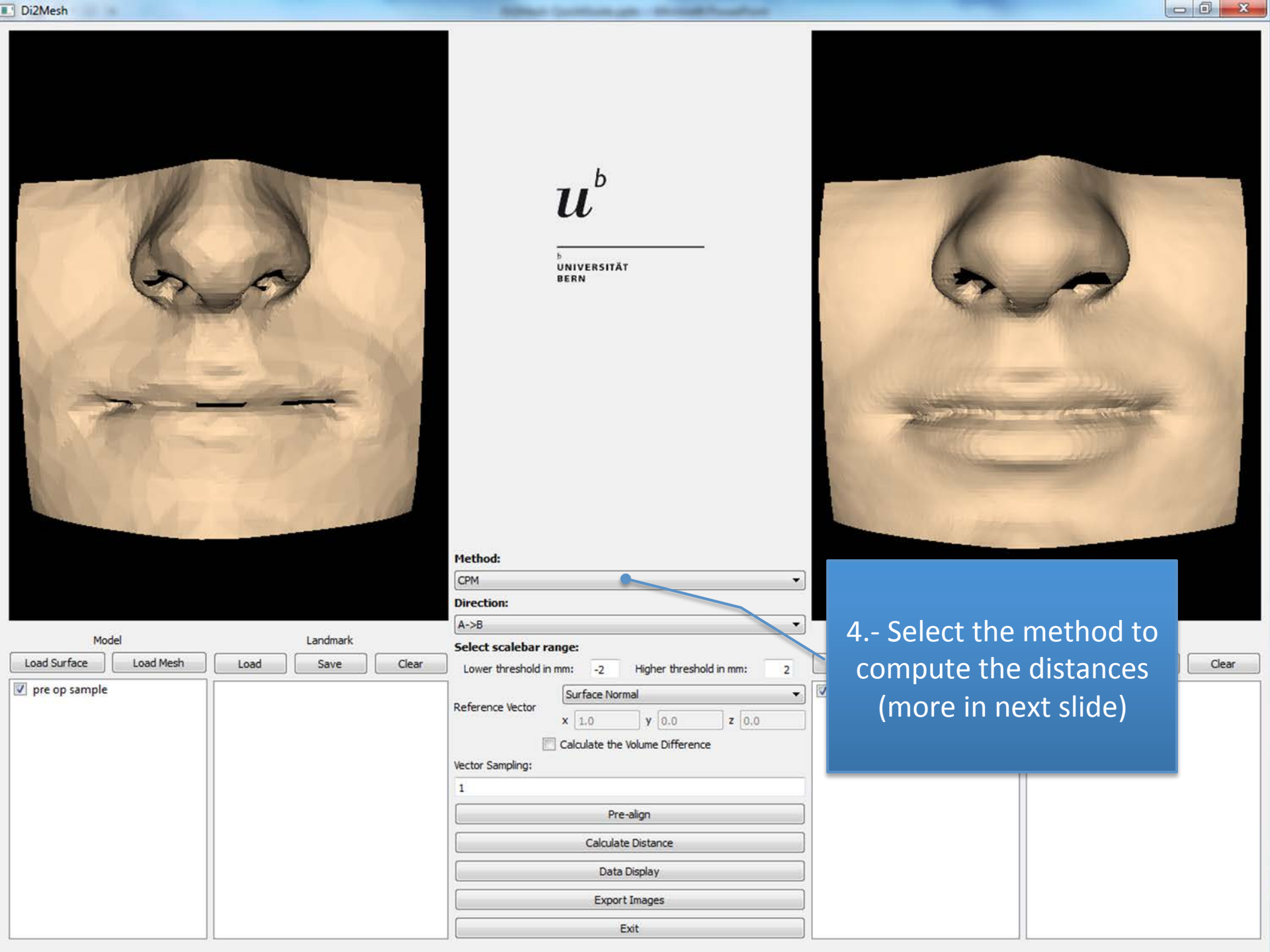
Method:
CPM
Direction:
A->B
Select scalebar range:
Lower threshold in mm:
-2
Higher threshold in mm:
2
Reference Vector
Surface Normal
x
1.0
y
0.0
z
0.0
Calculate the Volume Difference
Vector Sampling:
1
Pre-align
Calculate Distance
Data Display
Export Images
Exit
Model
Load Surface
Load Mesh
Landmark
Load
Save
Clear
pre op sample
post op sample
1.- Load pre-op surface mesh
2.- Load post-op surface mesh

Prior to calculate the displacement, make sure that there is no rigid deformation due to the differences in the pre and post operative coordinate systems. To align the frames, first select the landmarks where the corresponding points should be fixed. Then, press the Pre-align button shown in the figure. Skip this step if the coordinate systems are the same or no rigid displacement has occurred during the registration process.

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4.- Select the method to compute the distances (more in next slide)

Methods:

Di2Mesh proposes 4 methods to compute distances. In increasing degree of accuracy they are:

- MESH: closest points on triangular meshes
- CPM: closest points between surfaces using a polynomial.
- ICP+CPM: iterative procedure to find the CPM of the final polynomial surfaces
- TPS+CPM: Landmark-assisted distance computation + surface closest points

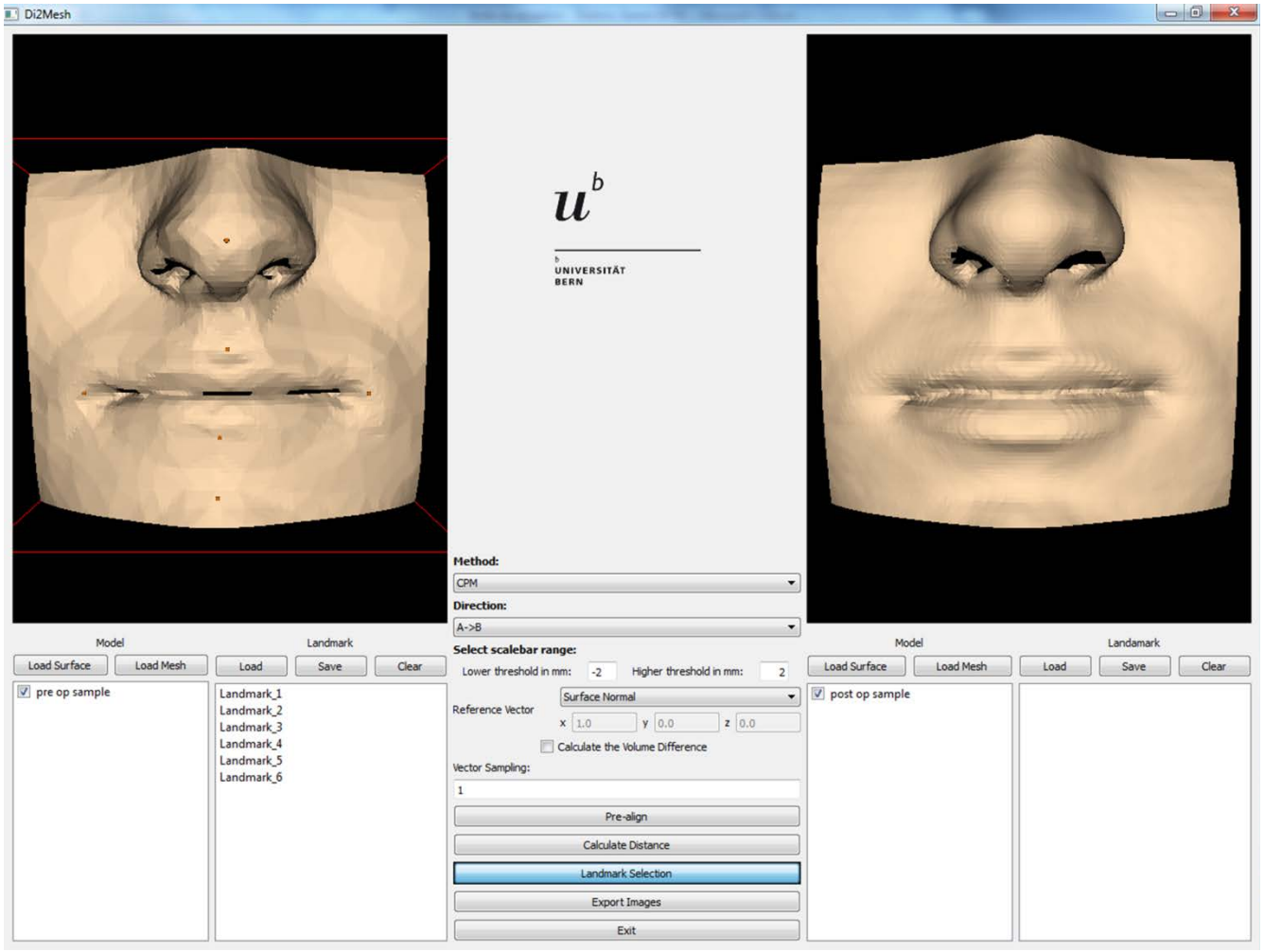
Landmarks in the pre operative image represent the anatomical points that should correspond to those in the post operative model. **They are only needed when using the TPS+CPM algorithm**. **For the other methods (MESH, CPM) there is no need for landmarks.**

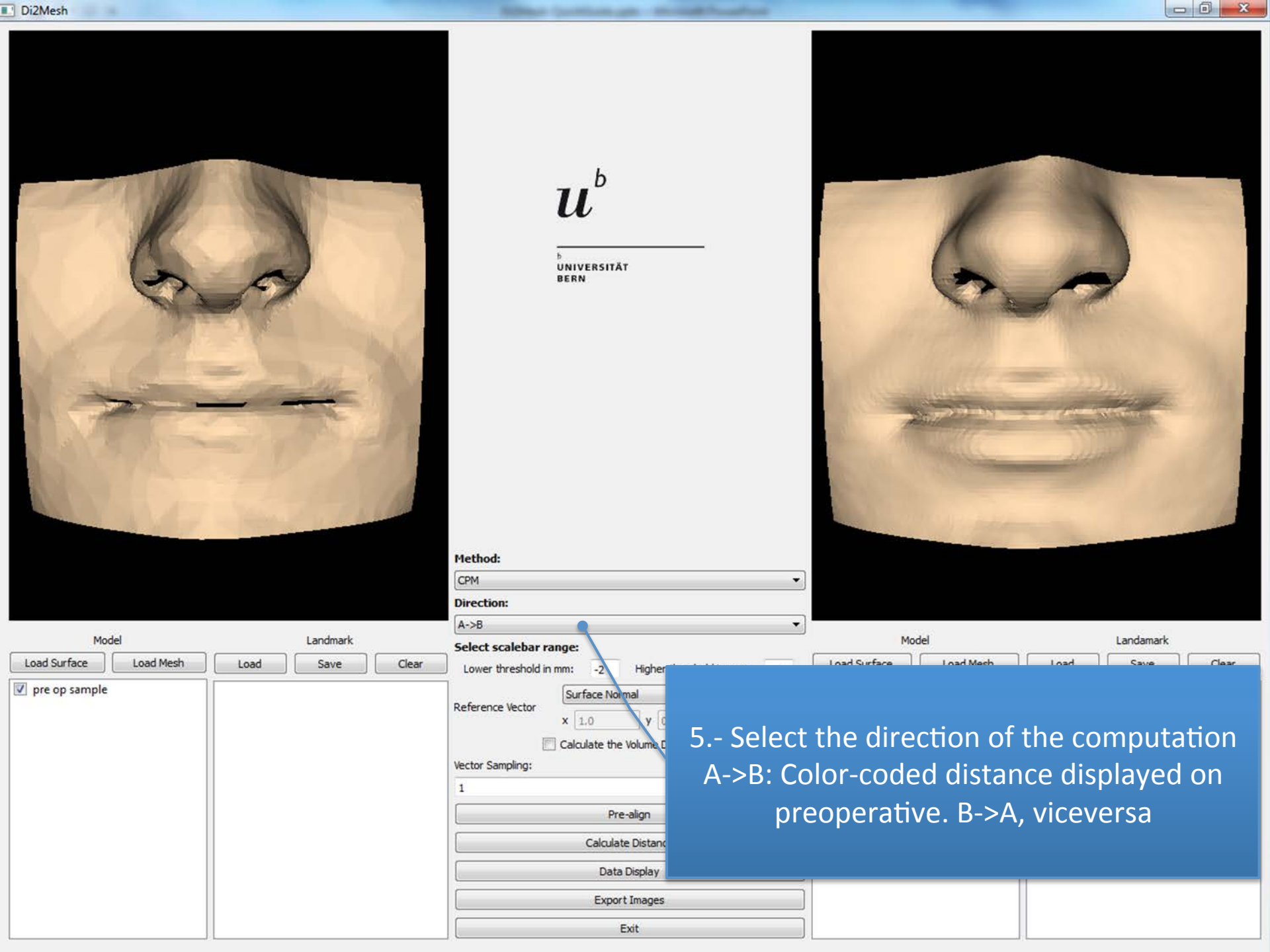
The TPS + CPM has the highest accuracy whereas the MESH method has the lowest one, and gives results when the displacement is high. However, when the displacement is small, the presented methods give close results.

Surface Normal uses the normal projection as the closest distance. While the other types use anterior-posterior (AP) projection and so on.

Selecting landmarks for TPS+CPM:

To define landmarks, first check that the button “Landmark Selection” is active (see figure below), then click on the 3D window to make it active and position the cursor where you want a landmark and press “P” on the keyboard. You should see a sphere after this.
Specify pairs of corresponding landmarks (at least three) on the pre and post surface models.

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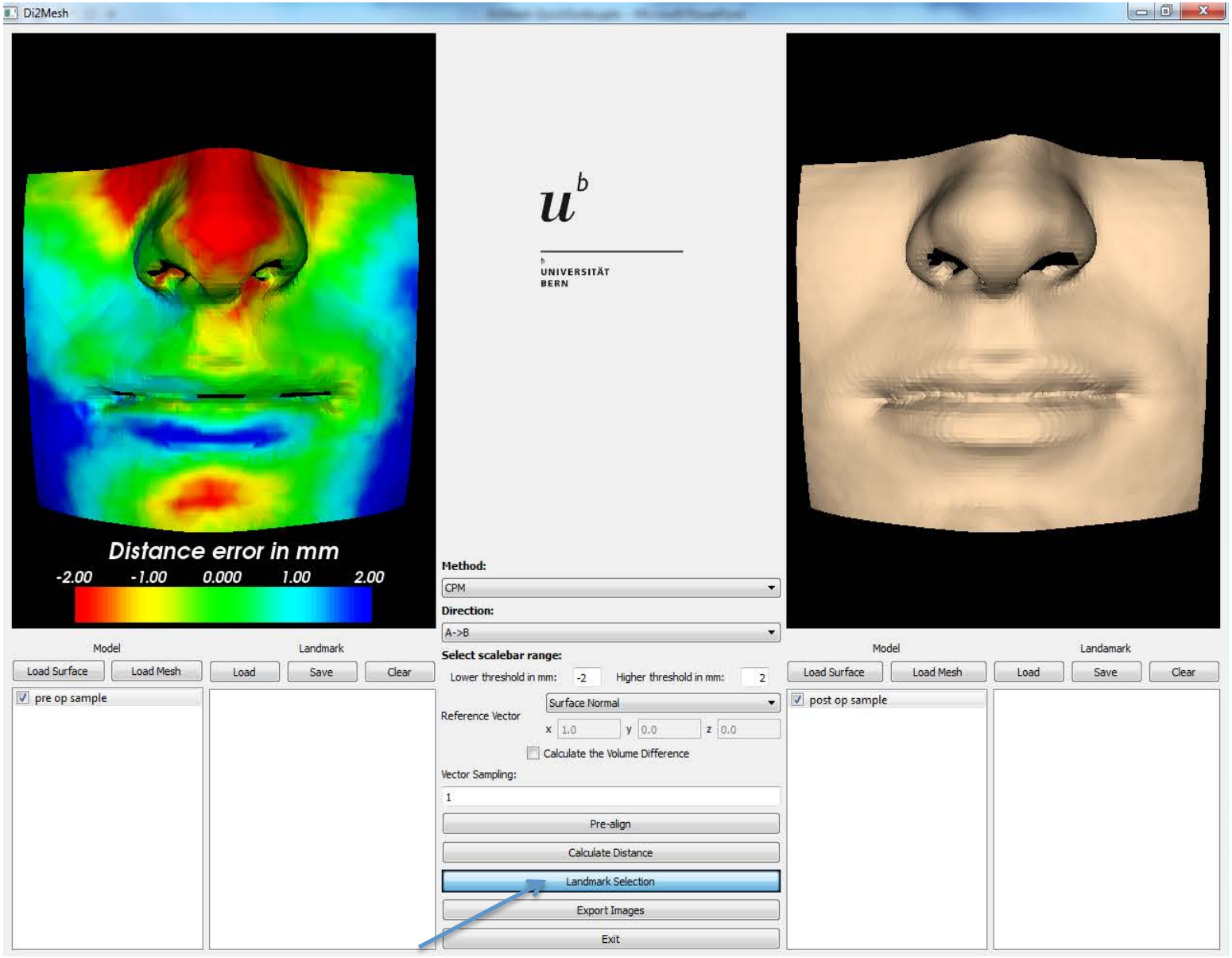
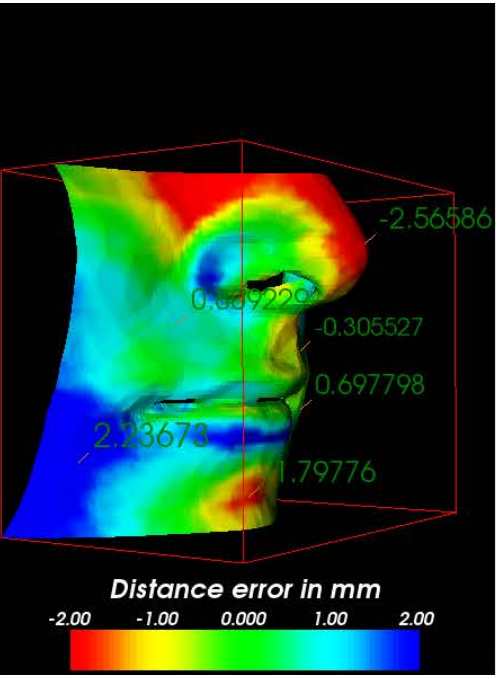
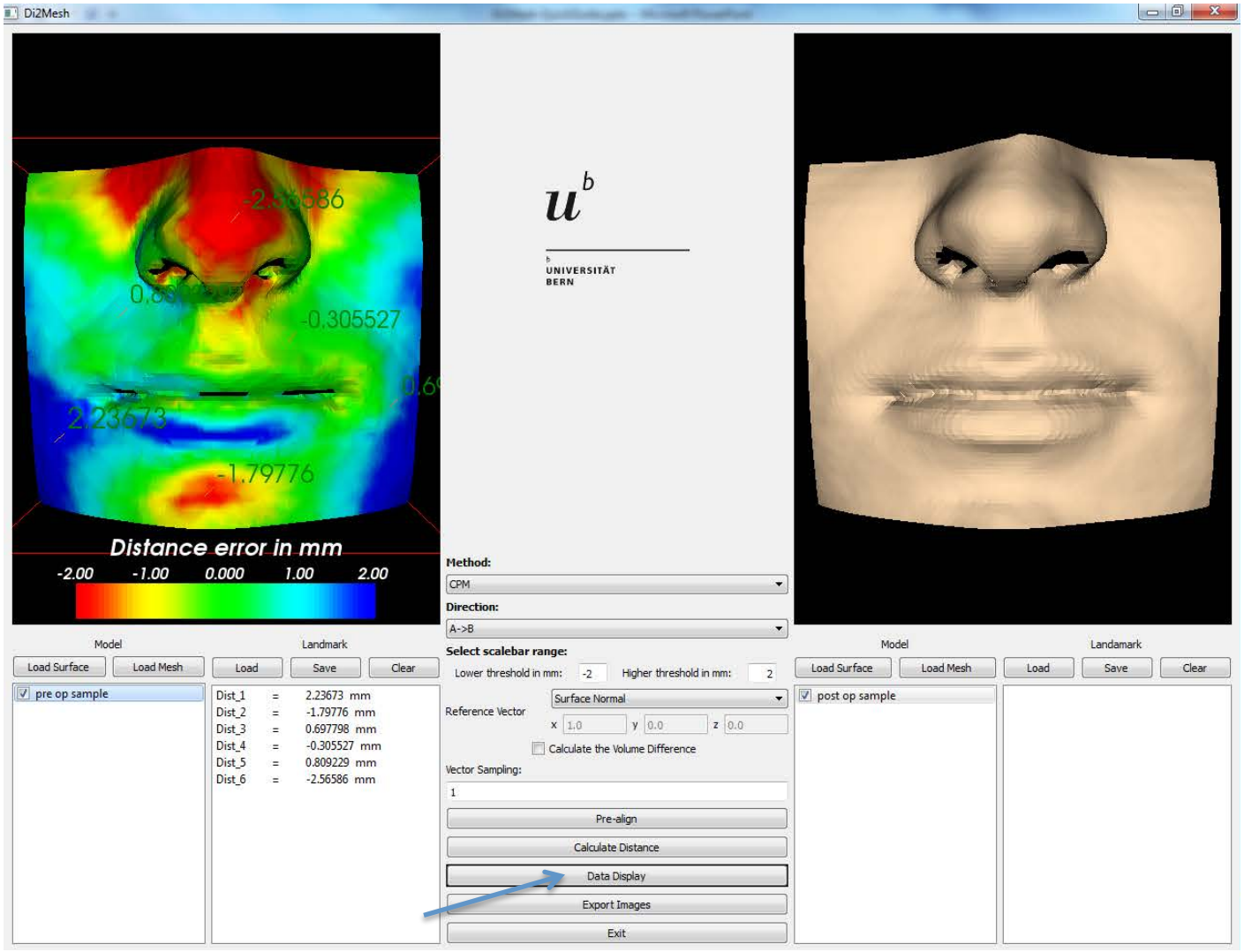
5.- Select the direction of the computation A->B: Color-coded distance displayed on preoperative. B->A, viceversa

Click the button “Calculate Distance”. A colormap will be generated and a file containing the coordinates of points and the distances will be written automatically in the setup directory as “projected_distance.txt”

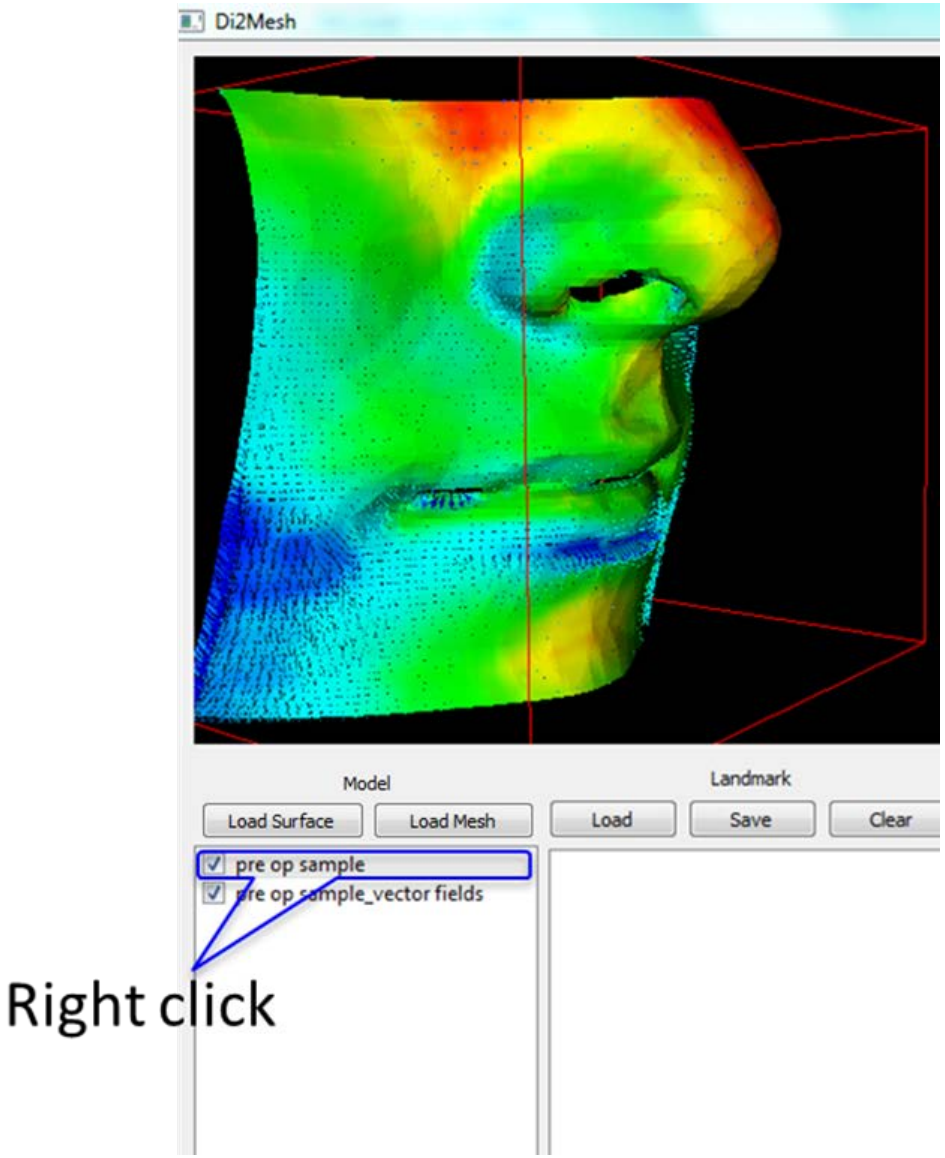


A “Click & See” scheme allows the user to know specific distances by simply clicking the region of interest. First, make sure the button “Data Display” is active (see figure below), then press “p” on your keyboard while pointing over the surface to know the distance at that point. The associated data is displayed and written as well in a list. It can be saved in a separate text file. To clear the selected points, press the Clear button.

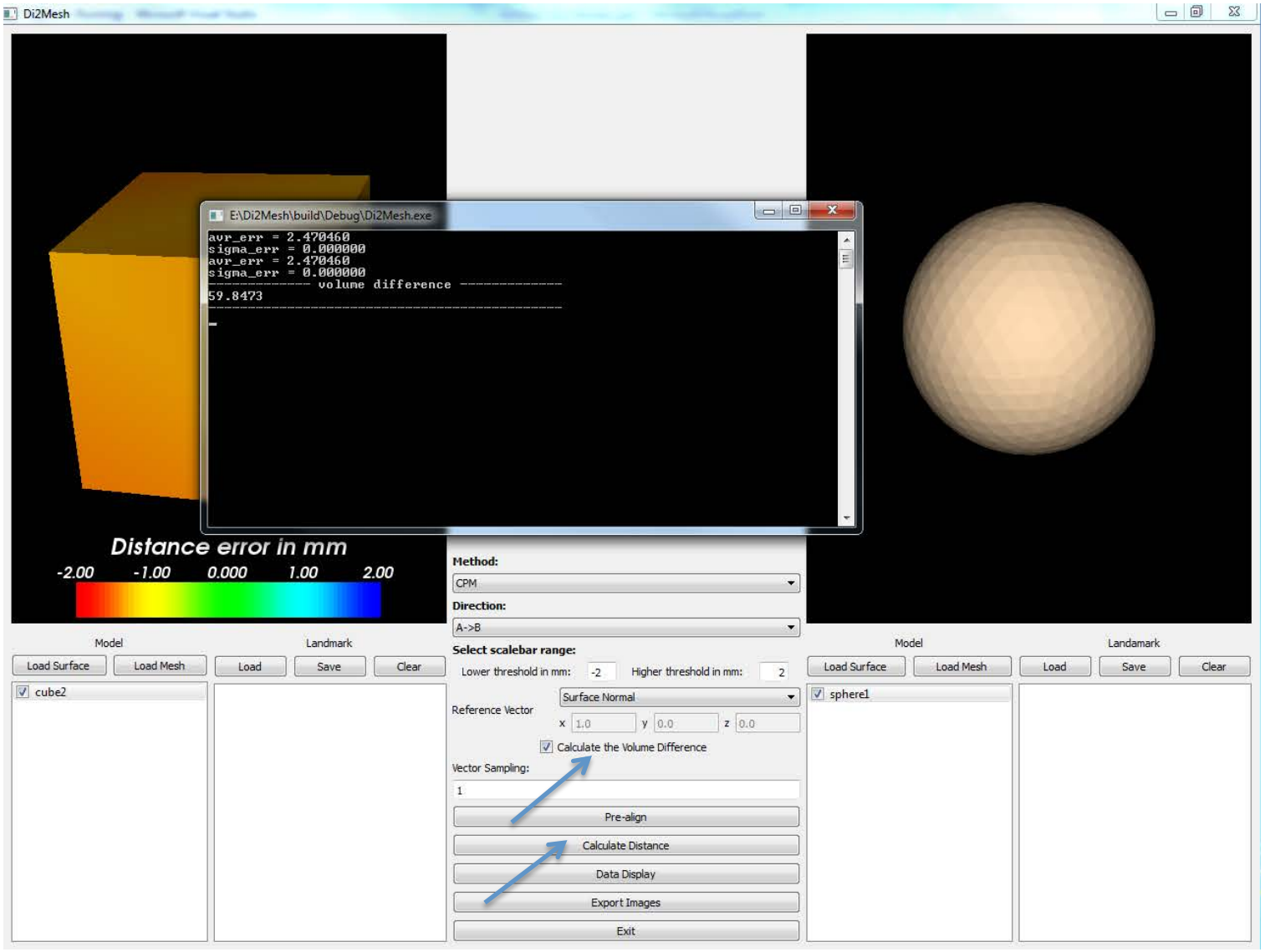




Visualizing direction: By clicking the right click button over a model name, it is possible to display the distance error as vector fields, as shown in the figure. The vector fields can also be saved to a file.



There is a checkbox for the volume difference measurement, if this is checked, the amount of volume difference is calculated after pressing the “Calculate Distance” and prints out in the command window. To measure correctly this value, the surfaces have to be closed



We hope Di2Mesh will be useful for you!

If you use Di2MEsh for publications, please acknowledge it as follow:

Hyungmin Kim, Philipp Jurgens, Stefan Weber, Lutz-Peter Nolte, Mauricio Reyes. *A new soft-tissue simulation strategy for cranio-maxillofacial surgery using facial muscle template model*. Progress in Biophysics and Molecular Biology. DOI: 10.1016/j.pbiomolbio.2010.09.004

Your comments and suggestions are very welcome:
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